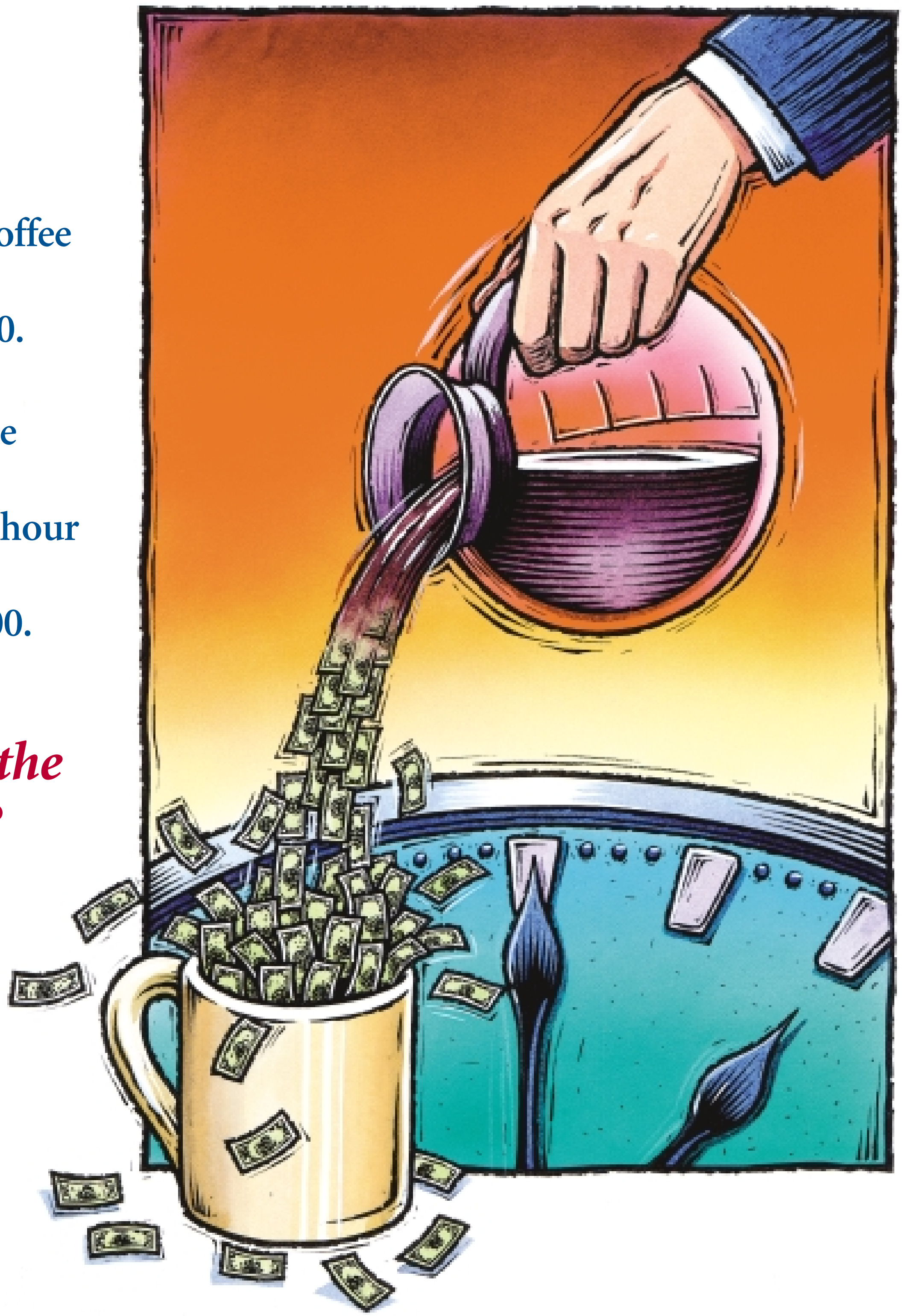
THE DEPARTMENT OF THE NAVY

Wants to Stimulate Your Thinking on

Controlling Electricity Demand Charges



Brewing a pot of coffee can cost a penny or $3.50.

Supplying shore electricity to a submarine for one hour can cost $77.00 or $22,500.

What makes the difference?

T I M I N G.

UNLIKE YOUR HOME ELECTRIC BILL, Navy and Marine Corps installations pay for their pattern of electricity use along with the quantity of electricity used.

In addition to charging different rates for electricity based on the time of day the electricity is used (called time-of-use rates), the utility also imposes a "demand charge" on large customers each month.

This demand charge provides an incentive for customers to reduce their electrical loads during periods when the total load on the system is approaching total capacity. *Demand charges can make up as much as one-half of your facility's electricity bill.*

Managing demand charges provides one of the best opportunities for Navy and Marine Corps personnel to reduce electricity costs.

WHY PAY A DEMAND CHARGE?

Your electric utility company must supply its customers with the total amount of electricity needed when it's needed. Because demand for electricity varies dramatically between day and night, summer and winter, *the time when electricity is used can be more important to the utility than how much is used.*

Electricity consumption at Navy and Marine Corps facilities is enormous and represents a sizable load to the utility company's system. The utility must have adequate generating capacity, transformers, and electrical cabling to support your base's maximum load. If high electricity demand on your base occurs simultaneously with the utility's other customers, the electrical system can be strained.

To meet maximum demand, called system peak demand, the utility company must run extra, less-efficient generating units or purchase electricity from other utilities at a premium price. This cost is passed on to industrial and commercial customers in the form of demand charges.

DEMAND CHARGE IMPACTS

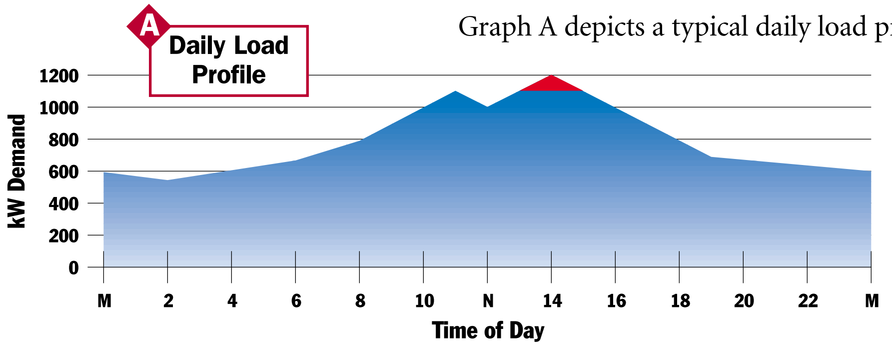
In an effort to control the total load on their system, the utility charges for electricity based not only on the amount of use, but also on when it is used. Special electric meters record power consumption to identify peak demand. A kilowatt registered during the identified peak demand period may cost far more than a kilowatt used at a different time.

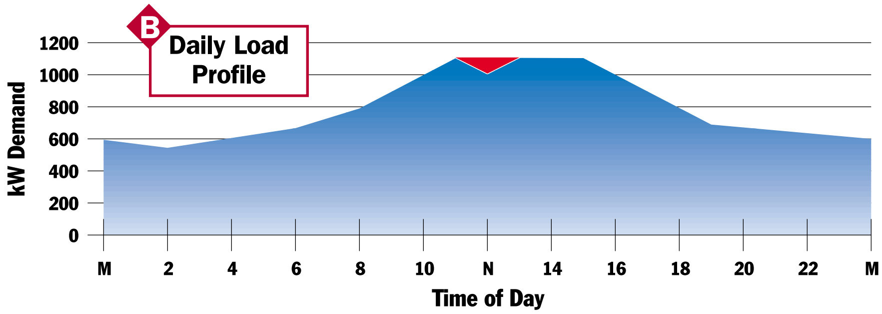
For example, if the demand charge per kilowatt is $16.44 in the summer and $2.85 in the winter, and your installation reaches a peak of 100,000 kilowatts during a summer month, the demand charge is $1,644,000 — and that's in addition to the rest of the bill! This charge is assessed even when a load is turned on for just one hour and the rest of the month you don't use any electricity.

Some utility companies assess "demand ratchets," which are minimum demand bills based on some percentage of the highest peak power metered over the preceding year. Consequently, one month's high demand can impact monthly charges for an entire year.

TYPICAL ELECTRIC USE LOAD PROFILES

Key to reducing your demand charges is knowing when your peak is likely to hit, thereby allowing you to schedule large loads, whenever possible, for off-peak hours. Cold iron or large industrial loads such as wind tunnels are good candidates for off-peak scheduling. The following Daily Load Profiles illustrate the benefits of load shedding.





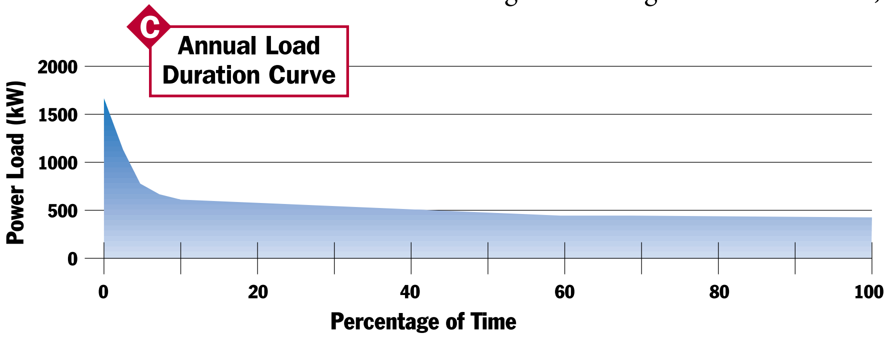
Graph A depicts a typical daily load profile. Use builds during the morning, drops slightly at noon, builds to a daily maximum at 1400 with a 100-kilowatt spike, and drops during the late afternoon and evening. This spike can be extremely expensive if it occurs simultaneously with peak monthly or annual demand.

If the 100-kilowatt load is scheduled to another time of day, noon for example, the peak load is constant from 1100 to 1500 hours (Graph B). The 100-kW spike is avoided because it was shifted to a time when it would not increase the daily demand.

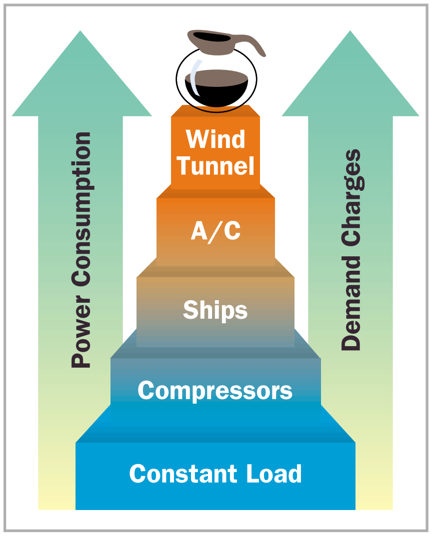
FREQUENCY OF PEAK DEMAND

How many hours per year does an installation experience its peak electrical demands? One tool for examining load duration is a graph called an annual load duration curve (Graph C). This graph depicts a base with a steep load-duration curve and shows that peak energy use occurs only a few hours per year. The majority of energy is used at a relatively constant rate throughout the year.

Taking advantage of opportunities to reduce the highest peaks, such as scheduling when a large load is turned on, can reduce electricity bills significantly.



UNDERSTANDING PEAK DEMAND



To illustrate the peak demand concept, think about the cost of brewing coffee.

It costs your facility one penny to brew a pot of coffee when the pot consumes one kilowatt of electricity for 5 to 10 minutes.

However, plug in that coffeepot on one of the hottest afternoons of the year when air conditioners and other high-energy use equipment are operating, and that pot of coffee can cost $3.51. The coffeepot load causes a one-kilowatt spike — setting a new peak demand level and jacking up demand charges by $3.50. Brewing that pot of coffee *now costs 350 times more* than the off-peak pot of coffee. When this concept is applied to large electrical loads at your facility, the cost consequences can be astounding.

Monthly costs at Naval installations can significantly increase if a one-hour spike occurs simultaneously with the monthly or annual installation peak as shown in the following table.

LOW & HIGH COSTS PER KILOWATT HOUR

Location	Lowest Cost kWh	Cost for Last kWh
Norfolk	$0.0224	$4.03
Mayport	0.0396	6.28
Pearl Harbor	0.0763	8.56
San Diego, Summer	0.0455	21.71
San Diego, Winter	0.0411	5.24

SCHEDULING LARGE LOADS

Cold iron costs can have a dramatic impact on shore electricity costs depending on a number of variables, including location, time of year, day of the month, and time of the day. In San Diego, the highest demand charges occur on the hottest day each month during the summer. In Norfolk, Mayport, and Pearl Harbor, demand charges are calculated on the greatest electrical demand each month.

The following table shows the difference in *hourly costs* between a submarine in cold iron during off-peak times (lowest cost) and peak demand times (highest cost). Other ships or loads that use more electricity will have proportionally larger demand costs.

SUBMARINE COLD IRON COSTS FOR ONE HOUR

Location	Lowest Cost	Highest Cost
Norfolk	$31.09	$4,022
Mayport	32.09	6,501
San Diego	77.14	22,495
Pearl Harbor	66.76	8,864

The dramatic cost difference for San Diego results from a high demand charge, significantly higher rates in the summer and the utility's time-of-use rates. Connecting a ship or operating any other large load at the wrong time — when the installation's highest peak demand occurs in the afternoon during the hottest days of summer — can cost tens of thousands of dollars.

REDUCING PEAK DEMAND CHARGES

You can save your installation thousands, if not tens of thousands, of dollars by practicing effective load shedding techniques appropriate to your facility. Load shedding is not designed to reduce energy consumption, but rather to shift usage to reduce or "shave" peak demand, which will result in lower demand charges.

Look and listen. Know when peak demand will occur. Pay attention to weather forecasts announcing the hottest and coldest days of the year, and calls for load shedding from your utility company. In addition, contact your PWC/PWD or utility for real-time electrical use information. Learn about your installation's load shedding initiatives and programs.

Know the impact of your equipment on peak demand. Turn loads off during the monthly peak demand interval, or schedule loads for periods of lower demand when operational considerations permit.

Stage equipment start-up at non-peak times. Whenever possible, schedule jobs consuming large amounts of power during off-peak hours or days. You can save your installation thousands of dollars. Document your peak avoidance scheduling efforts and share this information with your supervisor and PWC or PWD contact. Your efforts will be acknowledged.

Turn on stand-by or emergency generators. Many installations have emergency generators. Using these generators during peak electrical demand intervals to shave the peak can save thousands of dollars. Analyze your energy use patterns and electric rate structure to determine the benefits of installing new generating equipment.

Purchase high efficiency equipment. Energy-efficient equipment will reduce energy consumption at all times of operation.

Switch fuels. Dual-fuel heating and cooling equipment, fueled by either electricity or natural gas, allows the user to switch to natural gas during peak demand time periods.

Shed unneeded loads. The Navy and Marine Corps have worked hard to become more energy efficient. A lot of energy, however, continues to be wasted. Minimizing waste can be as simple as turning off lights and equipment when not needed. These simple actions taken during the hottest day of the year when every load contributes to skyrocketing demand charges can make a tremendous impact. At peak demand times, real energy conservation opportunities exist for everyone.

You have the power
to significantly reduce your installation's energy bill.
Understanding and planning for peak demand
will go far toward saving the Department of the Navy millions
of dollars each year — dollars needed to support
critical mission needs.

For more information, contact:

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